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(54) AN ARTICLE OF FOOTWEAR AND METHOD OF MANUFACTURE THEREOF

(71) We, RO-SEARCH, INCORPORATED, a Corporation organised under the laws of the State of Carolina, United States of America, of P.O. Box 188, Waynesville, North Carolina 28786, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the manufacture of articles of footwear, such as shoes and boots, with soles of elastomeric material moulded directly to the bottom of the upper, usually of a sheet material for example leather. Such direct moulding of the elastomeric sole material is carried out in a sole moulding device having a mould last and a sole moulding cavity formed by a usually divided side rim part and a piston shaped part for the bottom sole surface.

It is known to tighten the upper on the mould last by so-called stringlasting in the absence of a structural lasting sole or insole when the outer sole is strong enough to hold in position the lasting margin of the upper bonded by the elastomer to the sole. Often the welt secured to the upper at the lasting margin level is also bonded, as a result of the moulding operation, to the outer sole.

It is among the objects of the present invention to provide an improved article of footwear, and a method of manufacturing such footwear.

According to the present invention, there is provided an article of footwear having, with or without a structural insole, a pre-welted upper of a sheet material for example leather, and a sole of elastomeric material which is moulded to a pre-welted upper, wherein at least the visible portion of the welt is located on the upper at a

position above the insole level (as herein-after defined) of the sole, and the elastomeric sole material, at least on part of the sole periphery, extends upwardly to the welt and is fixed thereto.

It will be understood that, where reference is made to an article of footwear "without a structural insole," the term "insole level" means the uppermost surface of the sole material.

According to the invention furthermore, there is provided a method of manufacturing an article of footwear comprising the steps of providing the upper of a sheet material for example leather with lasting means and the welt strip, the welt strip being located at a position above the insole level (as hereinbefore defined) mounting and lasting the upper on a last of a sole moulding device in the loading position of the mould last, locating a welt plate against the welt and locking the plate in the desired position relative to the mould last in absence of the sole mould cavity; moving the upper on the mould last and the sole mould cavity into juxtaposition to clamp the outer rim of the welt between the welt plate and cavity rim, and moulding a sole comprising elastomeric material to the upper and at least part of the welt while maintaining the welt place spaced from the sole cavity part by means of the welt and an airgap; and while providing a temperature difference between the welt plate and the sole cavity part.

The invention is illustrated by way of example in the accompanying drawing in which,

Figure 1 is a part section showing the sole edge of an upper in relation to a part of a sole moulding device before juxtaposition with a sole mould cavity.

Figure 2 is a part section showing the same sole edge on conclusion of the sole moulding operation,

Figure 3 is a side view of a finished shoe, Figures 4 to 7 are part sections showing variations in the manufacture of the sole edges.

5 Referring to the drawing, there is shown a shoe having an upper 1 and an elastomeric sole 4 which extends, at part of its periphery, upwardly over the upper 1 as shown at 5 in Figure 3 to present an
10 apparent sole depth which is a multiple of the sole thickness 7 under the insole level 3. The apparent sole depth might vary, i.e. be greater at the toe and/or heel areas, and lower at the shank area 6. Correspondingly, more or less of the shoe upper 1
15 remains visible.

At the upper edge 2 of the sole extension 5 a sealing welt, located correspondingly spaced from the insole level 3, is secured to the material of the shoe upper 1, the welt consisting of an outward extension 15 and a portion 14 extending along the upper 1. The material of the welt is preferably elastomeric material compatible with the elastomer of the sole 4. The portion 14 is
25 secured to the upper by stitching 13 or other means, such as heat sealing.

In the manufacture of a shoe, the upper 1, with the welt spaced from a lasting margin 10, is mounted on a mould last 9 of a sole device, which includes a sole moulding cavity 25. In a loading station of such a soling device, the upper 1 is lasted, by a lasting string 11 secured to the edge
30 of the lasting margin 10, or by fastening the lasting margin 10, after tightening, to an insole 19, or by any other known lasting method. As shown in Figure 1, the lasting string 11 is located on the mould last side between the feather edge and the widest
40 part of the last. This results in a saving of material, and in a reduction in the shirring of the lasting margin. Figure 1 shows the replacement of the upper material, between the welt 15 and the lasting margin
45 10, by a strip 24 secured as by stitching 20 to the lower or inside portion 14 of the welt. Different, and less expensive, material than the visible upper material 1 may be
50 used for the strip 24.

As shown in Figure 4, the portion 14 of the welt extends downwards to form the lasting margin 10 and to carry the lasting string 11. When less lasting stresses are
55 needed, the pre-welted upper 1 might be held on the mould last 9 by means only of a welt plate 16. When full lasting is required, the strip 24 can be extended, as shown at 28 in Figure 7, to include not only
60 the lasting margin 10, but also a portion carrying the vamp 26. Elastomeric sheet stock 28, which is inherently pervious, or is made pervious by providing it with perforations, is preferred because of its light
65 weight, and its strength to take the lasting

stresses of the upper, and provide resiliency and strength to the upper if bonded to even very soft leather of thinner gauge.

After the mounting and lasting of the pre-welted upper 1 on the mould last 9, a
70 flat welt plate 16 is used to move the outward extension 15 of the welt from the position shown in Figure 1 into the position of Figure 2. The welt plate, which is divided
75 lengthwise, is carried by supports 30 in pre-selected spaced relationship with the mould last 9, so that the correct position of the welt extension 15 can easily be checked by the operator in the loading station. The
80 absence of a cavity side frame and/or a cavity bottom ensures ease of flattening the welt, as well as facilitating inspection. Thereafter, the unit of mould last, with
85 welt plate and its locating and locking supports 30, is moved into juxtaposition with the sole moulding cavity 25. In closing the mould cavity, the edge of the welt
90 extension 15 is clamped between the welt plate 16 and an edge 32 of the mould cavity 25 so that there is no direct contact between the metal of the mould cavity and
95 the material of the upper. Frequently, the moulding cavity parts are heated while the welt plate 16, spaced from the heated parts by the outer edge or extension 15 of the
100 welt, remains cool. The welt plate 16, as a result of the insulating effect provided by the welt, remains cool to the touch, even if the bottom cavity is heated to the high temperature necessary for vulcaniza-
105 tion. This allows the operator to handle the welt plate 16 freely during the moulding operation thus increasing his efficiency. This feature also permits the use of heat-sensitive upper materials, such as polyvinyl
110 chloride, which would otherwise be burned by contact with the welt plate. The clamping of the outer edge or extension 15 of the welt ensures not only the aforementioned spacing, but also reliable sealing of the mould cavity even if elastomers with a
115 very high flow rate, such as blown urethanes, are used. The welt plate 16 is also used to force the material of the upper 1 around a deformation 21 formed in the
120 mould last 9, such as a step as shown in Figure 1, or a groove as shown in Figure 6. In either case, deformation of the material of the upper 1 around an edge ensures satisfactory sealing of the upper to the
125 last to prevent the running of elastomer upwardly beyond the sealing deformation.

After moulding of the sole 4, either by pouring, injection or other moulding, the
130 article of footwear is removed from the soling device and the previously clamped extension 15 of the welt is trimmed to the sole circumference. The trimming after de-moulding can be very close to the upper, giving a nearly weltless appearance, with-

out danger of elastomer flowing to the outside of the welt.

The lasting margin, which might be part of the upper material, or other material connected to it, or to the welt, in another embodiment of the invention, is fastened to a centreless insole, i.e. an insole which extends to the feather edge but is open in its centre to allow the inward movement of the lasting margin even after it is secured to the insole. The centreless insole 29, as shown in Figure 7, is thereafter at least at its inner portion, embedded in the elastomer of the sole. The absence of a centre in such centreless insole allows stitching of the lasting margin, either from the inside or the outside of the insole. In either case, the embedding of the inner edge of the insole improves the process of securing the sole to the upper.

WHAT WE CLAIM IS:—

1. An article of footwear having, with or without a structural insole, a pre-welted upper of a sheet material for example leather, and a sole of elastomeric material which is moulded to the pre-welted upper, wherein at least the visible portion of the welt is located on the upper at a position above the insole level (as hereinbefore defined) of the sole, and the elastomeric sole material, at least on part of the sole periphery, extends upwardly to the welt and is fixed thereto.

2. An article as claimed in claim 1, wherein the material between the welt and the insole level differs from the upper material visible above the welt, the arrangement being such that the welt connects the upper material above the welt with the material below the welt.

3. An article as claimed in claim 2, wherein the material below the welt carries a lasting means which is located above the insole level, and below the widest part of the upper.

4. An article as claimed in claim 2, including the lasting means in the form of elastomeric sheet stock connected to the upper material above the insole level, the elastomeric sheet stock extending upward inside at least part of the vamp as a pervious, resilient carrier for thin and supple leather.

5. An article as claimed in claim 1, wherein the upward sole extension has a depth which is a multiple of the sole thickness below the insole, the extension being tapered towards the sole bottom.

6. An article as claimed in claim 1,

wherein the welt comprises elastomeric material compatible with the sole elastomer, the welt extending towards the insole level and carrying lasting means.

7. An article as claimed in claim 1, wherein lasting means in the form of a lasting margin at insole level, is secured to a centerless insole which is at least partly embedded in the sole elastomer.

8. A method of manufacturing an article of footwear as claimed in any one of claims 1 to 7, comprising the steps of, providing the upper of a sheet material for example leather with lasting means and the welt strip, the welt strip being located at a position above the insole level (as hereinbefore defined) mounting and lasting the upper on a last of a sole moulding device in the loading position of the mould last, locating a welt plate against the welt and locking the plate in the desired position relative to the mould last in absence of the sole mould cavity; moving the upper on the mould last and the sole mould cavity into juxtaposition to clamp the outer rim of the welt between the welt plate and cavity rim, and moulding a sole comprising elastomeric material to the upper and at least part of the welt while maintaining the welt plate spaced from the sole cavity part by means of the welt and an air gap; and while providing a temperature difference between the welt plate and the sole cavity part.

9. The method as claimed in claim 8, wherein the lasting step is carried out by tightening a lasting string located between the widest part and the bottom of the last, while the lasting string is secured to material connected to the upper.

10. The method as claimed in claim 8, wherein the lasting step includes the fastening of a lasting margin to a centerless insole and thereafter embedding and fixing at least the inner edge of the centerless insole in the elastomeric sole material.

11. The method as claimed in claim 8, wherein the upper is provided with lasting means comprising elastomeric sheet stock, extending inside the vamp of the upper as a resilient and at least partially pervious carrier for thin and supple upper material.

12. The method as claimed in claim 8, wherein the welt plate secures the sealing of the mould cavity both on the outside of the upper by clamping the welt between the welt plate and the outside rim of the mould cavity, and on the inside of the upper against the mould last by pressing the edge of the welt plate against the

material of the upper to conform it to the wear, substantially as hereinbefore
last. described. 10

13. Footwear substantially as herein-
5 before described with reference to the
accompanying drawing.

14. The method of manufacturing foot-

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